



Bus Rapid Transit System for Jaipur

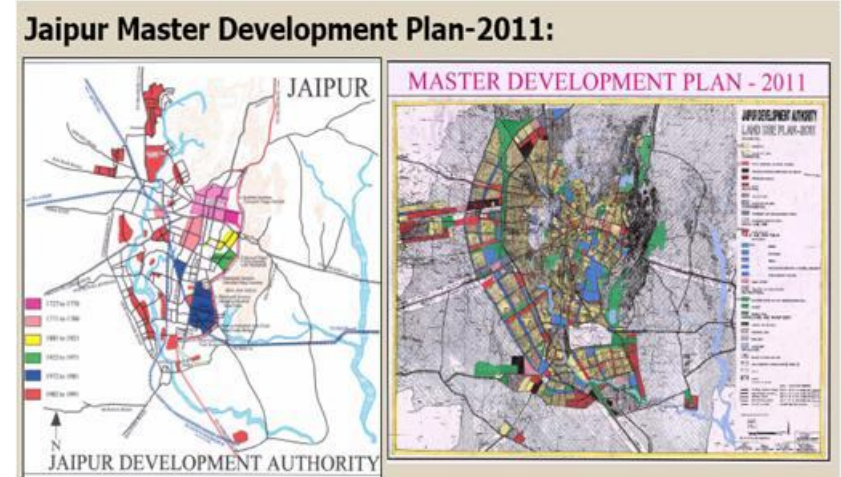
...redefining the joy of traveling

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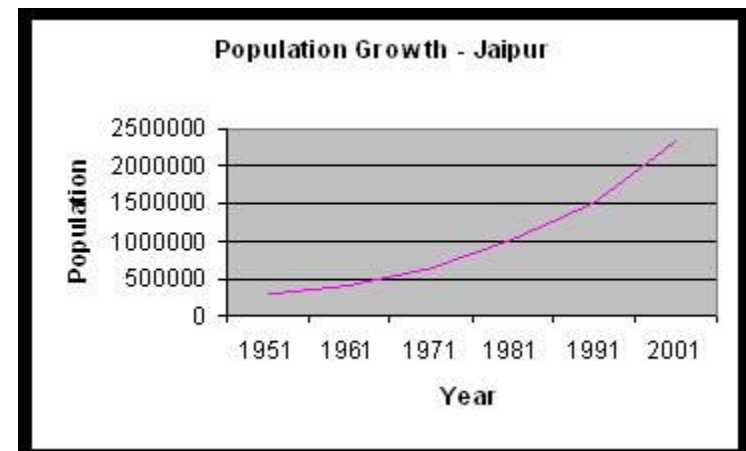


City Profile

- Jaipur, the capital city of Rajasthan is
 - Administrative Headquarter
 - Fast Growing City
 - Major Tourist Attraction Point



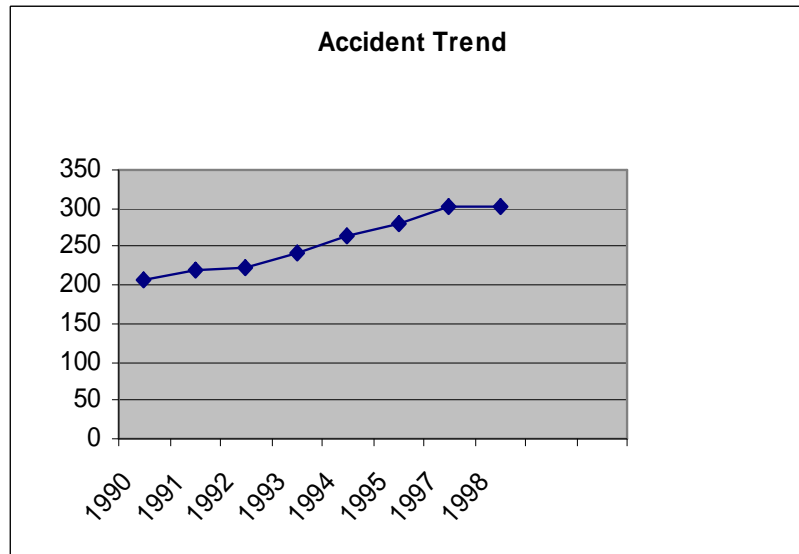
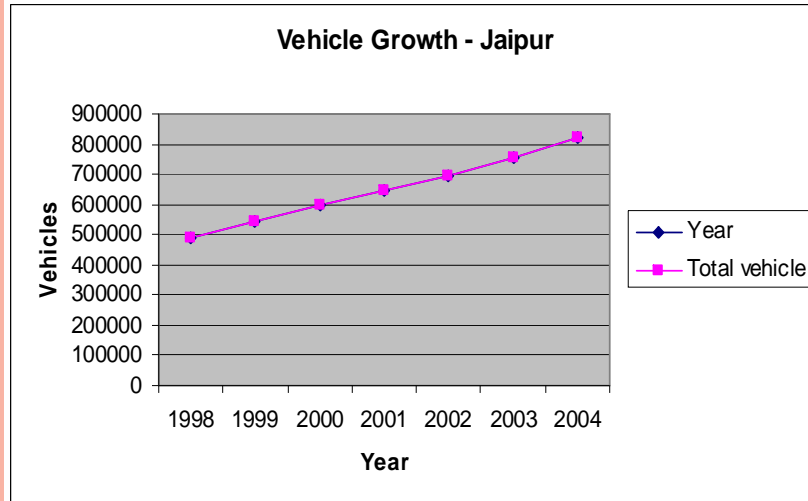
Sl.No	Year	Population	Annual Growth (%)
1	1951	304380	
2	1961	410376	3.0
3	1971	636768	4.5
4	1981	1015160	4.8
5	1991	1518235	4.1
6	2001	2324319	4.4



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Vehicular Growth



Name of the Road	Volume/ Capacity	LOS
Jawahar Nagar Bypass	1.02	F
J.L.N. Marg	0.41	B
Tonk Road	1.32	F
Sahkar Marg	1.29	F
MI Road	0.96	E
Ajmer Road	1.3	F
New Sanganeer Road	0.3	A
Sirsi Road	0.67	C
Sikar Road	0.97	E

- Overall vehicle growth 9.4 %
- Growth of cars 11.6 % and growth of Buses is only 2.3% in 2003-04
- Inadequate and inefficient Public Transport System is Fueling the Growth of Private Modes
- Increasing Congestion on Road Network

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Existing Public Transport System

- Existing Public Transport System in Jaipur includes Mini Buses operated by private operators and standard buses by RSRTC
- There are about 1500 mini buses and 230 RSRTC buses on various routes
- Existing Transport system provides lower quality of service.
- Public Transport Share is much lower than optimum (~ 19%)
- Accidents due to Mini buses are increasing

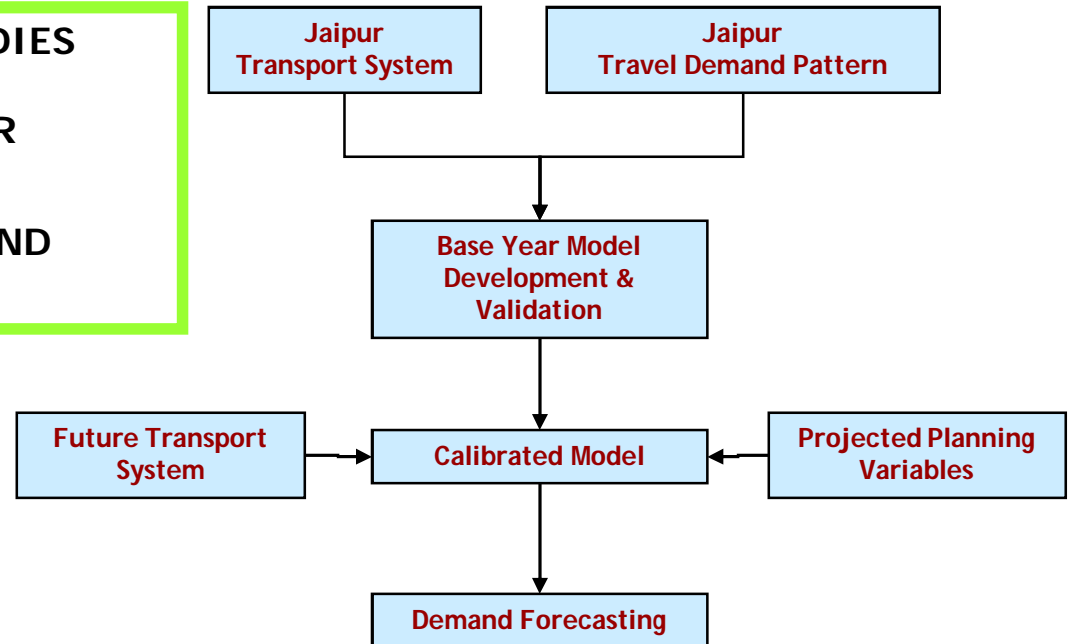


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Travel Demand Forecasting

1. DETAILED TECHNICAL STUDIES CARRIED OUT FOR TRAVEL DEMAND FORECASTING FOR JAIPUR CITY
2. FOUR STAGE TRAVEL DEMAND MODEL WAS USED



Travel Demand (Mode-wise O-D)

- Public Transport
- Car
- Two Wheeler
- Auto Rickshaw

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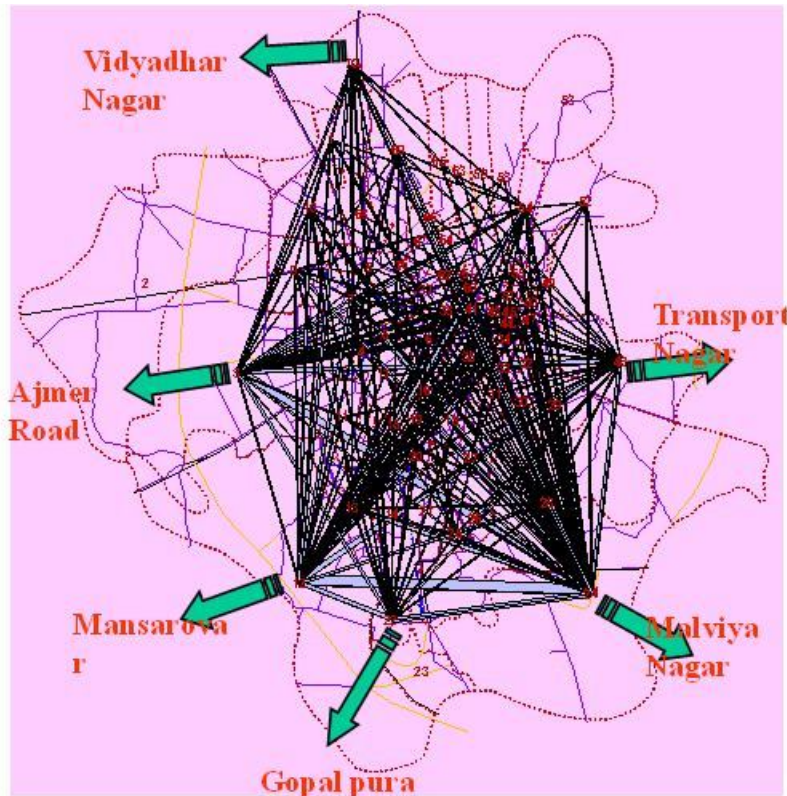
TRAVEL CHARACTERISTICS

- Total Daily Passenger Trips: 27 Lakhs
 - Share of Public Transport Trips: 19%
 - Share of Private Trips: 81%
- Per Capita Trip Rate: ~1
- Average Trip Length:
 - Public Transport: 6.5 Km
 - Private Vehicles: 8.7 Km

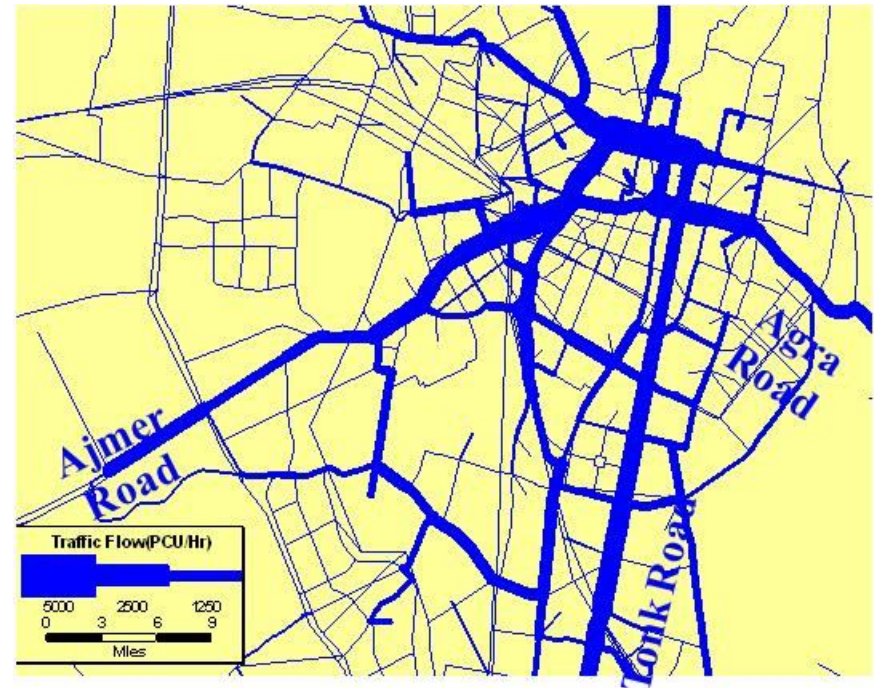
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Travel Demand Forecasting



Desire line – Passenger Trips



Traffic Assignment

- DESIRE LINE INDICATED HIGH SHARE OF TRIPS FROM NORTH, SOUTH & EASTERN PART OF CITY AND MODERATE SHARE FROM WESTERN PART
- TRAVEL DEMAND ESTIMATED RANGE -2000 TO 6000 PPHPD

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TRANSIT SYSTEM OPTIONS



Commuter Rail



Mono Rail



Heavy Rail Transit



Bus Rapid Transit



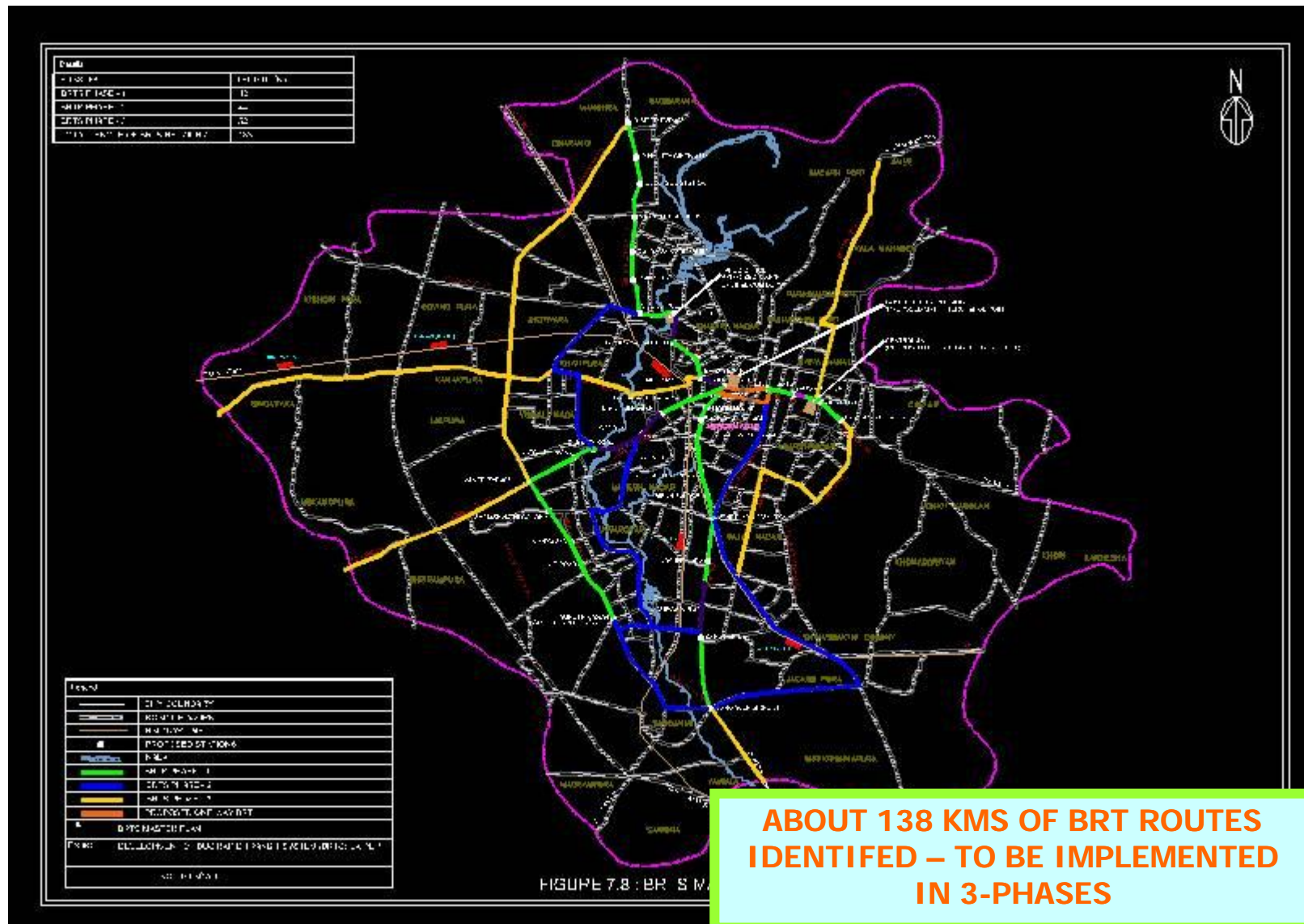
Light Rail Transit

RIDERSHIP PATTERN RECOMMENDED BRT AS MOST FEASIBLE MODE FOR JAIPUR CITY

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BRT Master Plan



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BRT Corridors Under Implementation

North-South Corridor:

Pkg-I- C Zone bypass to Panipech via Sikar Road

(7.0 km)

Pkg-II- Panipech to Sanganer Airport via Tonk Road

(19 km)

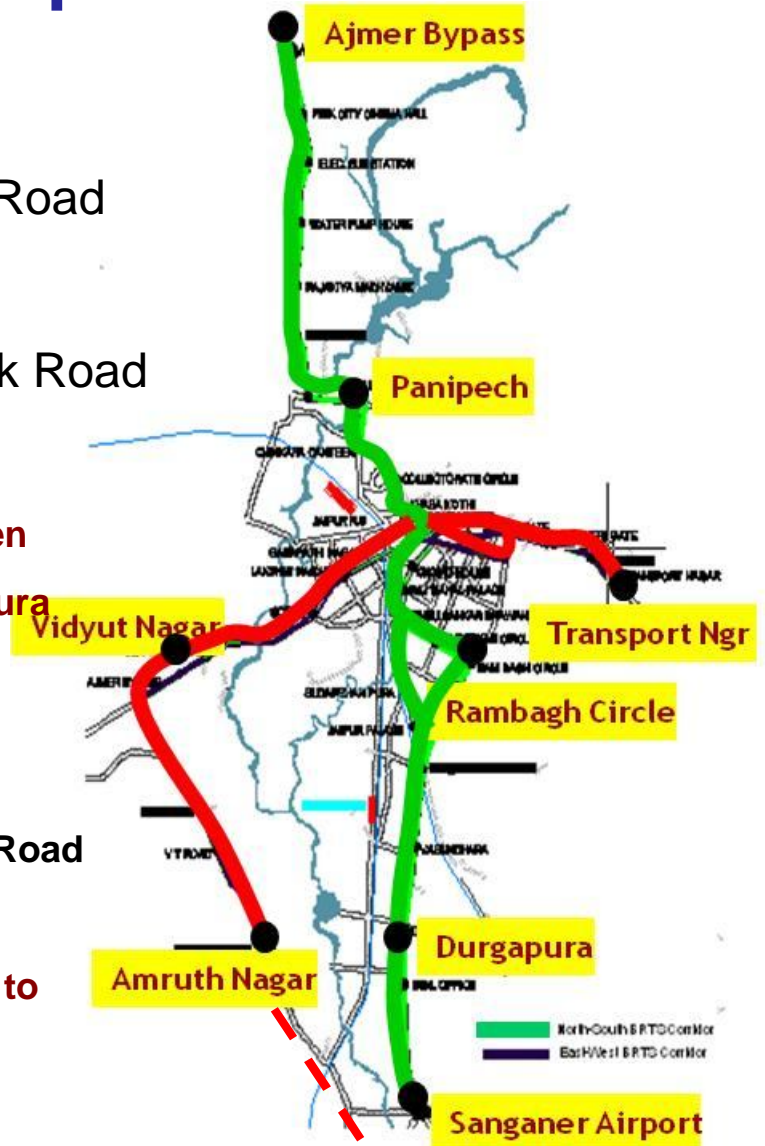
- Flyover from Panipech to Chinkara canteen
- Flyover at over narrow section at Durgapura

East-West Corridor:

Pkg-III- Transport Nagar to Ajmer bypass via Ajmer Road

(19 km)

- Elevated Road at Ajmer road (Ajmer Pulia to Queen's road crossing)



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Design Elements

BUSWAY PLACEMENT

Bus ways along median side

Most of the Project Corridors have

- Excessive side entries
- on street parking & commercial development
- Closely spaced junctions - every 400-700 m



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Design Elements

BUSWAY PAVEMENT OPTION

Flexible Pavement-adopted

ADVANTAGES

- Low Initial Cost
- Optimum utilisation of existing crust
- Shorter construction period & less long term complexities
- Wider choice of construction agencies



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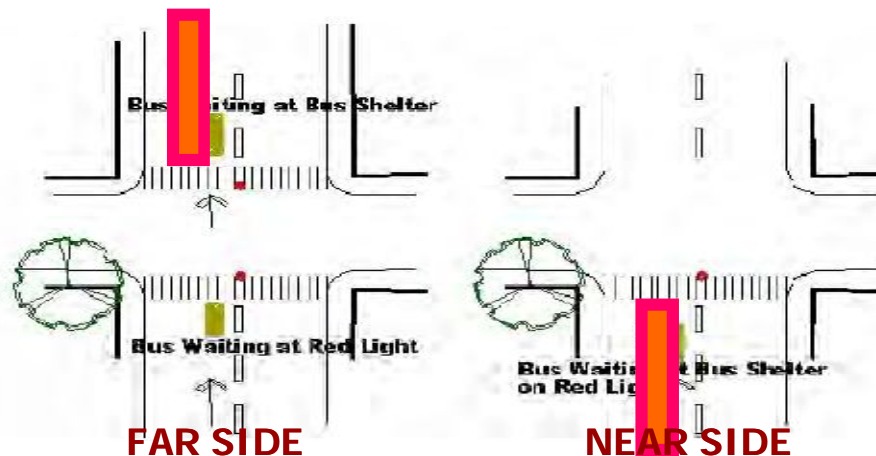
Design Elements

PLACEMENT OF BUS STOP

Near Side Bus Stop Placement Recommended For Optimising Efficiency

ADVANTAGES

- No Pileup of buses on to the Junction
- Use of red light time as dwell time for pedestrian
- Can easily be extend in future



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Design Elements

BUS STOP PLATFORM HEIGHT

Platform to be design for 400 mm floor height

ADVANTAGES

- Boarding- alighting of passengers through ramp
- Plan for Ultra Low Floor Buses
- Entry-Exit ramp



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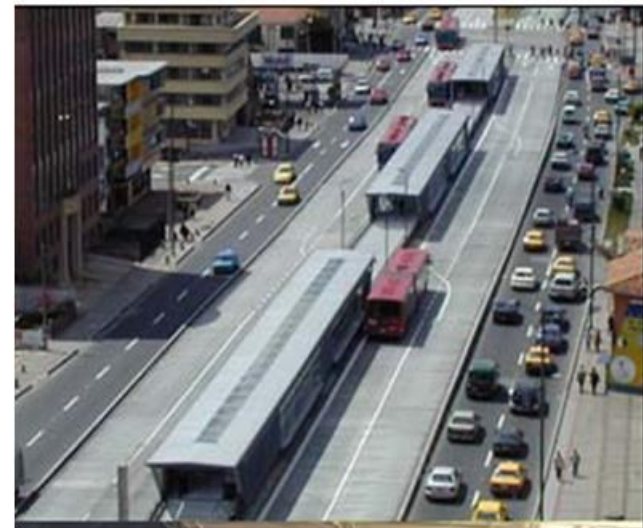


Design Elements

BUS STOP LENGTH

Depend upon the demand on the bus stop

- Minimum two shelters at bus stops (30 m)
- Length of platform 12 m with 6 m headway
- Passing lane proposed at the stations of high bus traffic

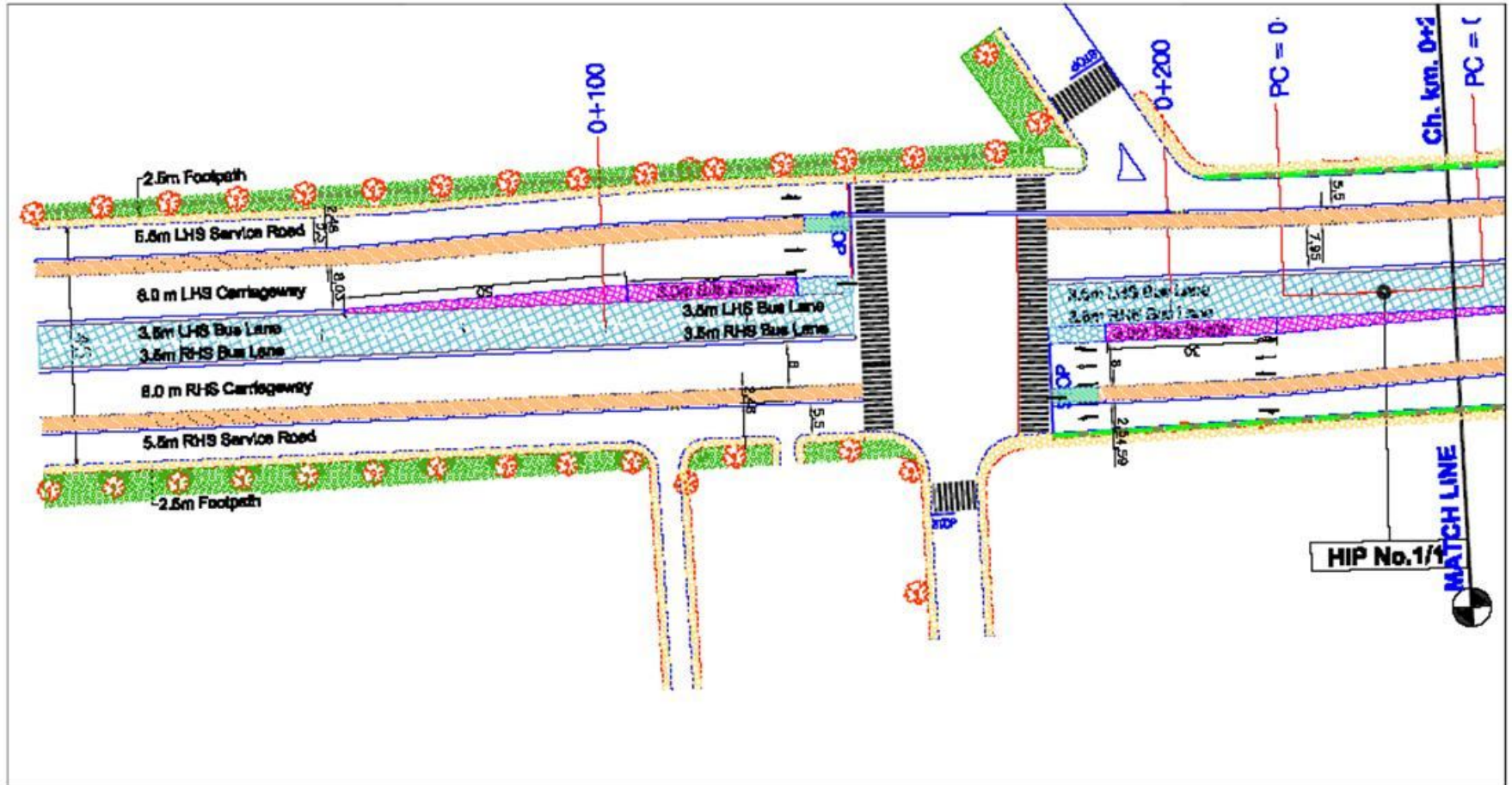


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Design Elements

DEDICATED NMV/CYCLE LANE

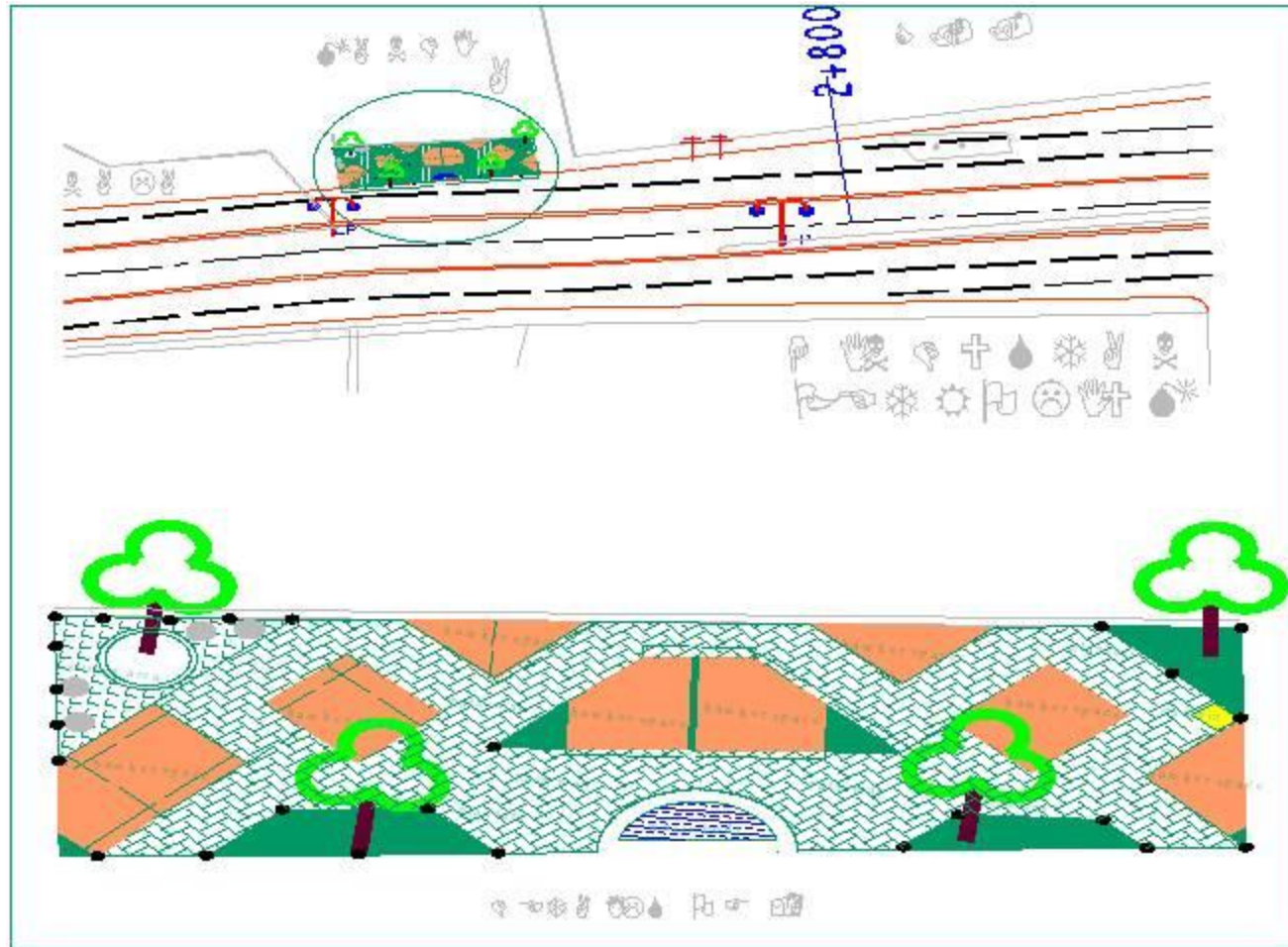


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Design Elements

HAWKERS ZONES

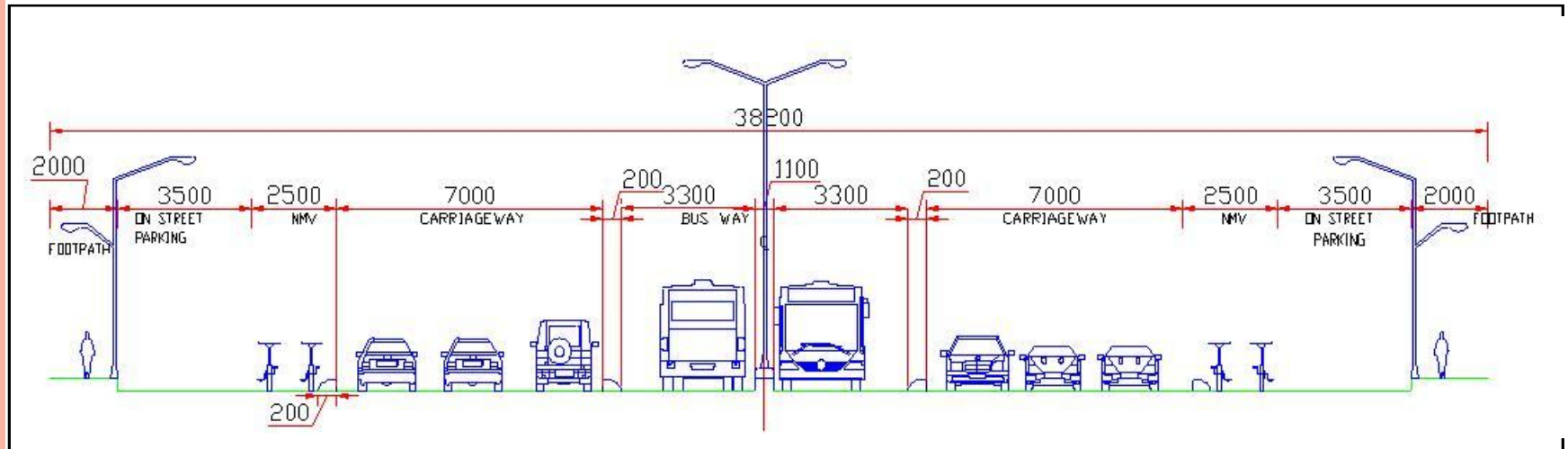


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Design Elements

MULTIUTILITY LANE



- Bus ways: 3.3 m
- Multi. Purpose Lane: 6.0 m
- NMV near MV lane

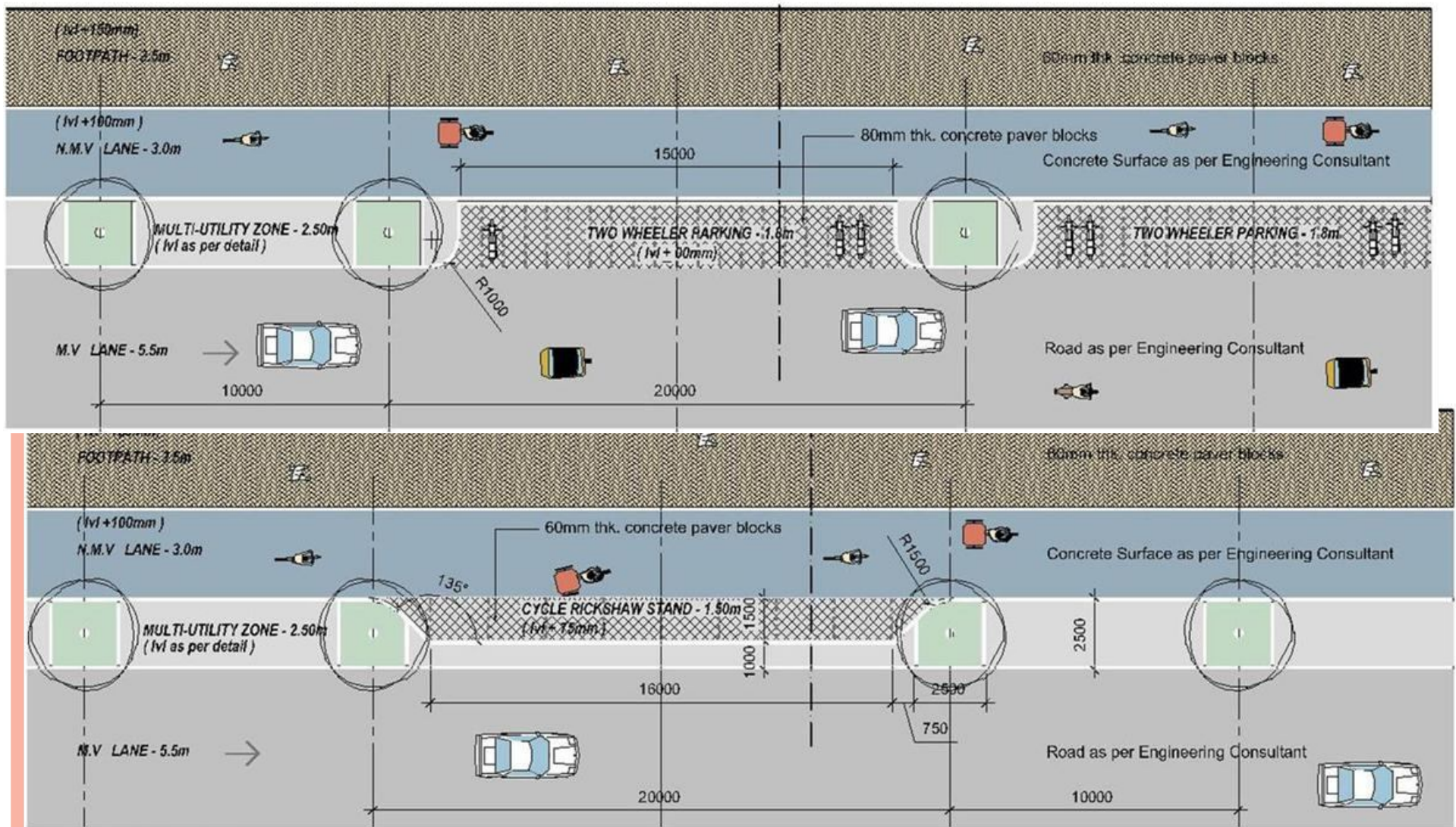
- Saving most of the trees
- Only Parallel parking
- NMV Track
- Cycle/2W/Car/Auto Rick. Parking
- Post box/garbage collector/toilets/hawkers etc.

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Design Elements

MULTIUTILITY LANE



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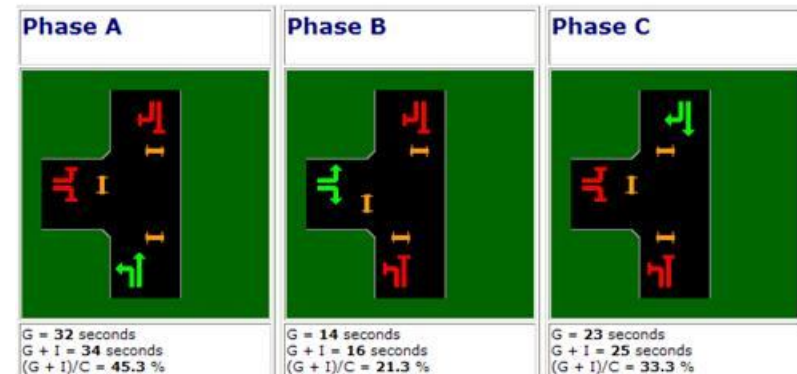
INTERSECTION DESIGN AND PEDESTRIAN FLOW MANAGEMENT ALONG BRT CORRIDOR

- Intersection Design along BRT Corridors using Latest Software – aaTraffic SIDRA
- Optimum Signal Phasing Determined by testing various alternative flow combinations.

Phasing

Title: Japur BRT (Chomu Pulia Circle)

C = 75 seconds
 Cycle Time Option: Optimum cycle time (Minimum Delay)
 Phase times determined by the program.

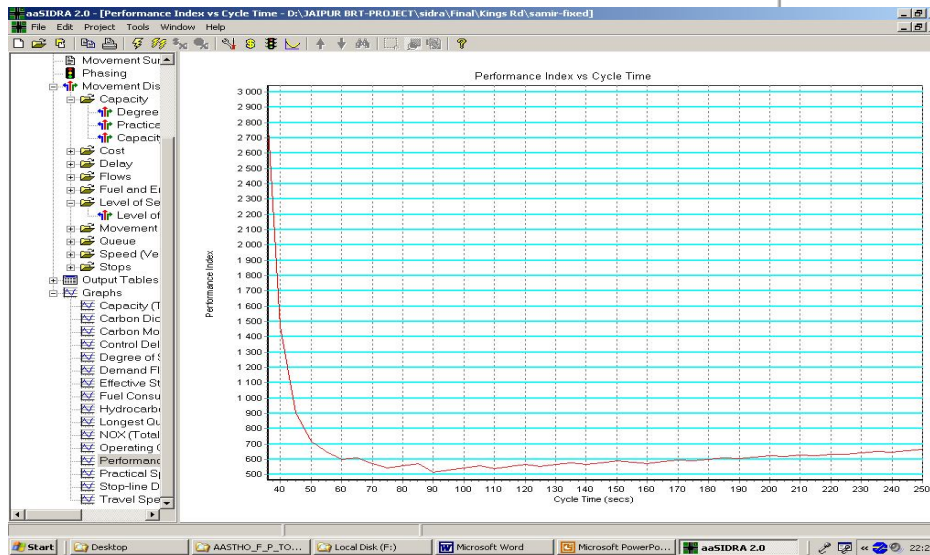
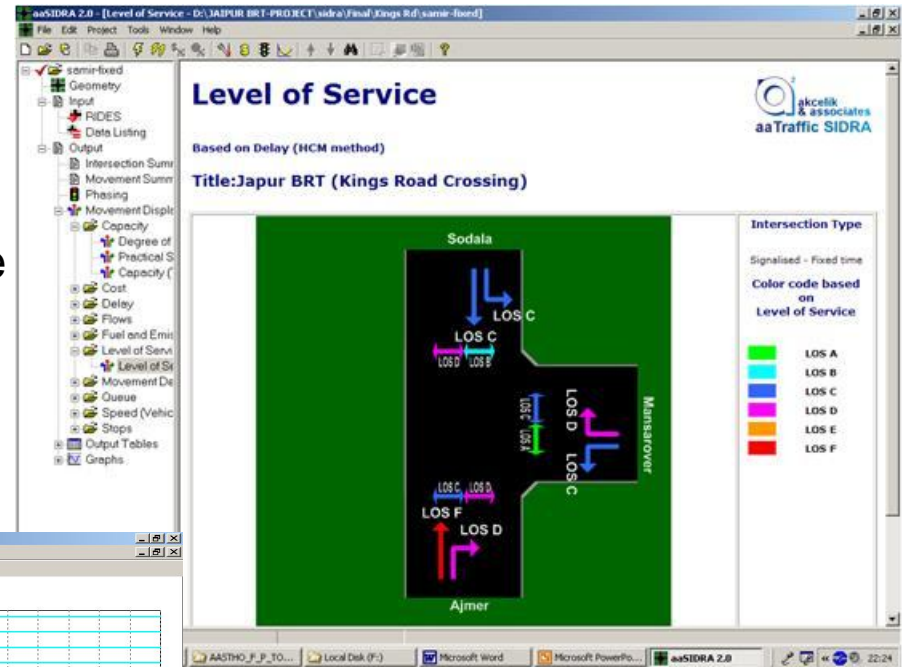


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INTERSECTION DESIGN AND PEDESTRIAN FLOW MANAGEMENT ALONG BRT CORRIDOR

- Level of Service is determined for various vehicular flows and pedestrian movements.
- Possibility of providing exclusive signal phase for pedestrian movement tested at important BRT stations



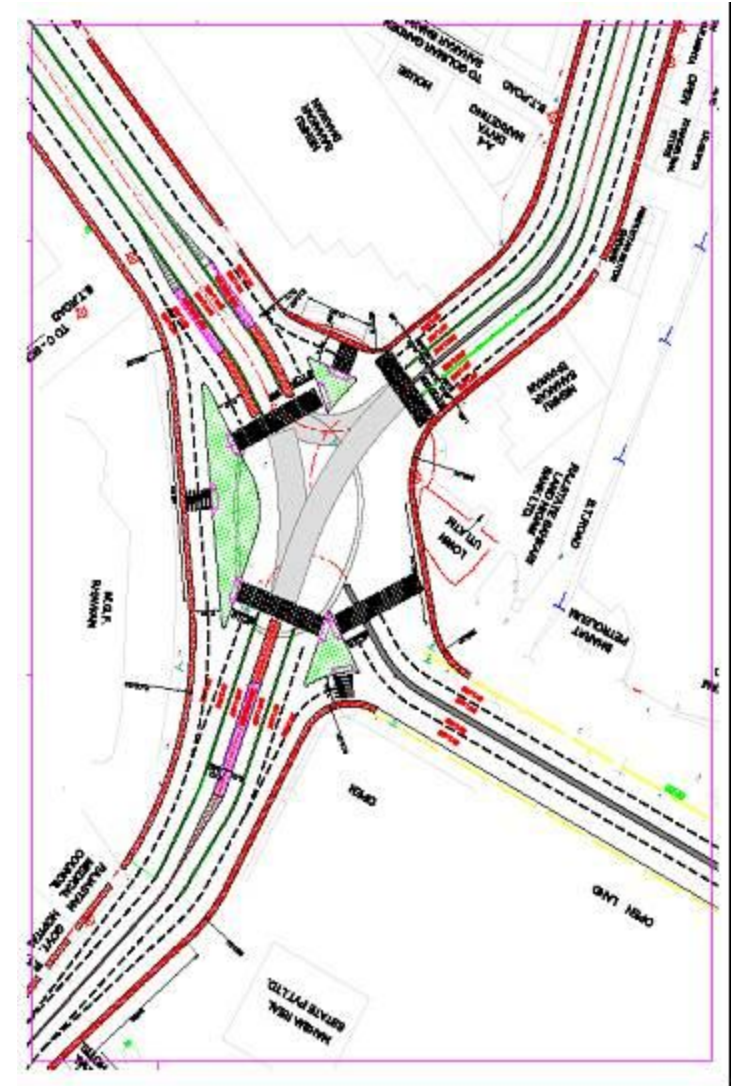
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INTERSECTION DESIGN AND PEDESTRIAN FLOW MANAGEMENT ALONG BRT CORRIDOR

For safe pedestrian dispersal :

- Safe Pedestrian crossing under Signal protection.
- Speed control of left turning vehicles for safety enhancement.
- Improvement in intersection geometrics & facilities for efficient traffic dispersal (provision of refuge islands, wide footpaths)

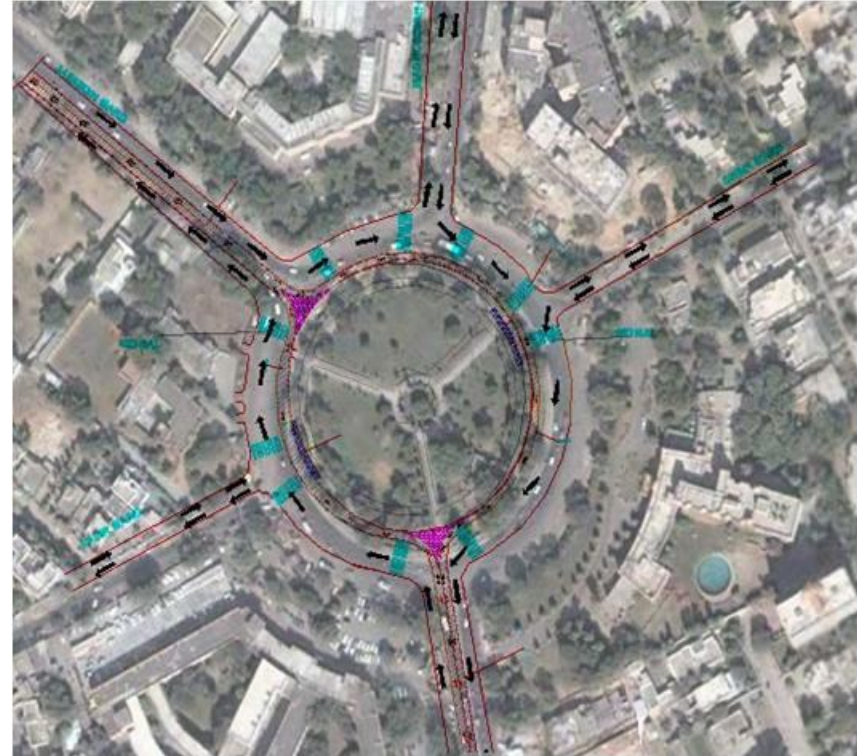


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INTERSECTION DESIGN AND PEDESTRIAN FLOW MANAGEMENT ALONG BRT CORRIDOR

Treatment of Various Types of Junctions customized as per site, traffic and control conditions

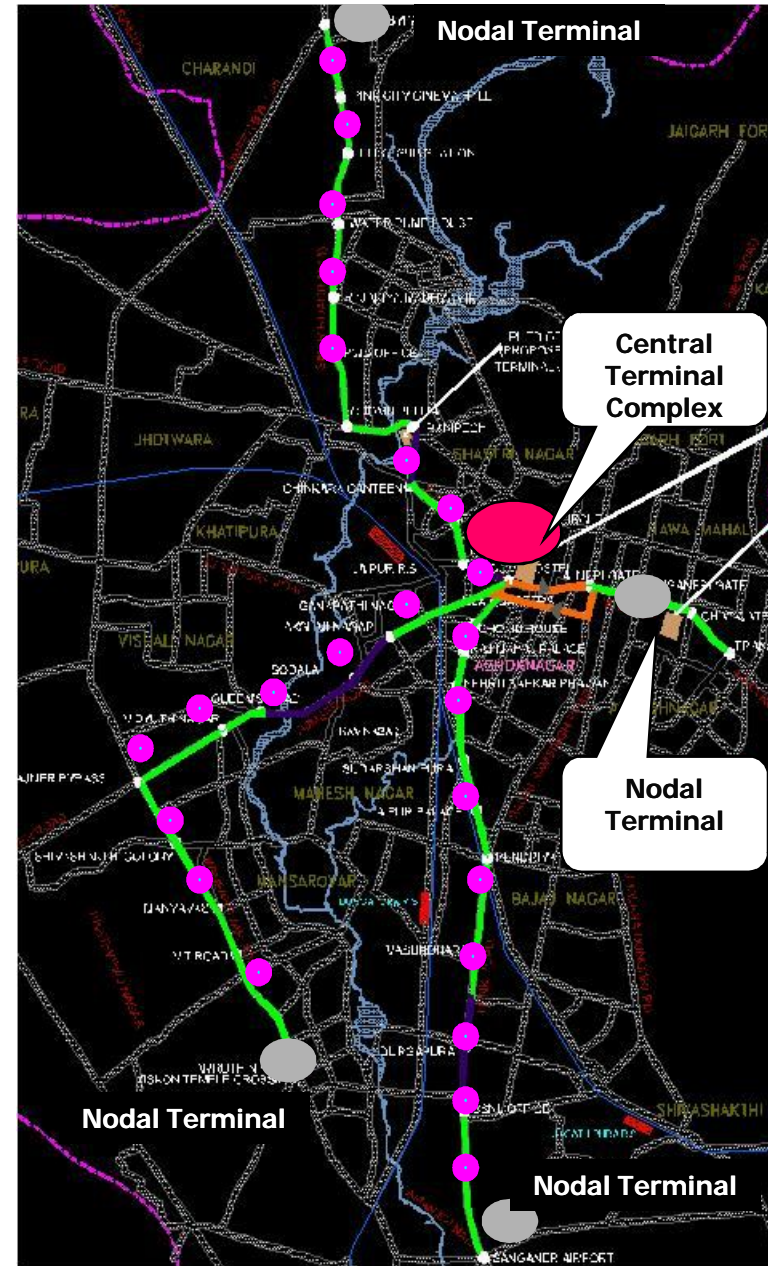


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Terminals

- **Central (1 nos) – Govt Hostel**
With passenger amenities and crew facilities. Also commercial & business complex to increase the revenue generation & demand
 - **Nodal Terminals (3-4 nos) : at Harmada , Sanganer, Transport Nagar**
 - **For implementation, all Terminals to be taken as a separate tender package**
-
- Will be linked with the final operational plan
 - Terminals to be used as revenue generation sources with the PPP perspective



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Vehicle Selection

Bus Floor Options

- Ultra Low Floor = <400mm
- Low Floor -650 mm

To be decided by the committee formed for the selection of bus technology

Cost
Indian – 12 lakhs



High Floor Conventional

Cost
Indian – 25 lakhs



Cost
Indian – 40 lakhs
Foreign - 80 Lakhs



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Intelligent Transport System (ITS)

Application of ITS in following areas:

- **Passenger Information**

- Pre-recorded micro-processor based audio-video information about route , stop , etc.
- Use of electronic video display system mounted on the front, side & rear of the bus for external displays to commuters at stop.
- Mounted inside the bus for on-board commuters.
- Speakers synchronized with visual displays mounted at the entry - exit gates.
- The messages about the route, next stop shall be displayed & changed by manual intervention by crew.
- The messages shall be communicated in English and Hindi.

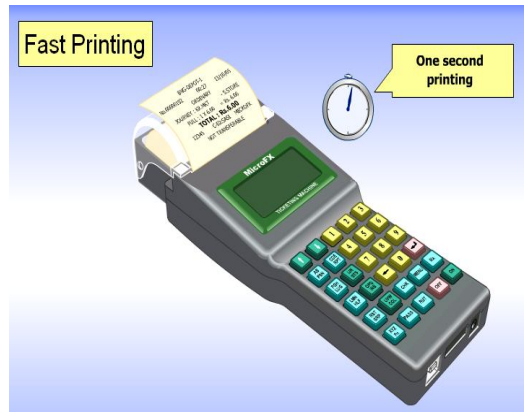
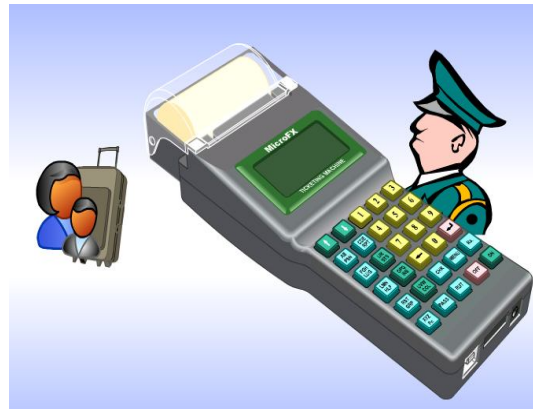
- **Tracking for monitoring & control of Vehicles**

- There are various options available such as GPS based, RFID based
- RFID Technology preferred on the considerations of cost and coverage

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Fare Collection System



ON BOARD TICKETING SYSTEM



OFF BOARD TICKETING SYSTEM AT STATIONS & TERMINALS

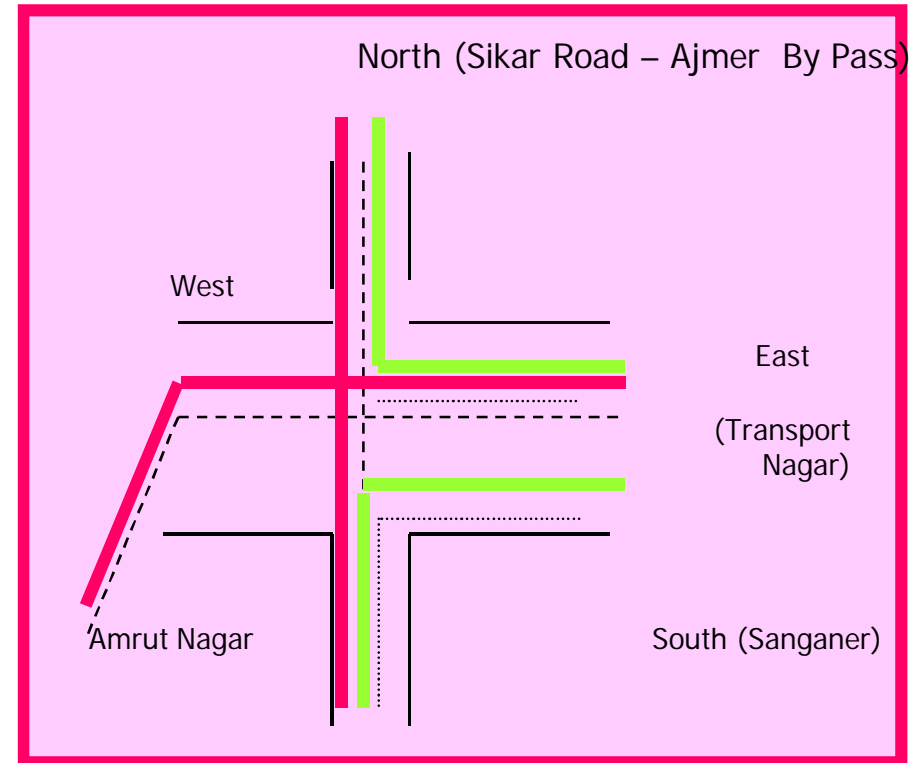
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Operation Plan for Buses

- Design of Trunk Routes for BRTS:

Direction	Daily Volume (Person Trips)
N-E	33,963
N-W	8,955
N-S	28,782
E-S	22,183
E-W	20,783
W-S	8,962



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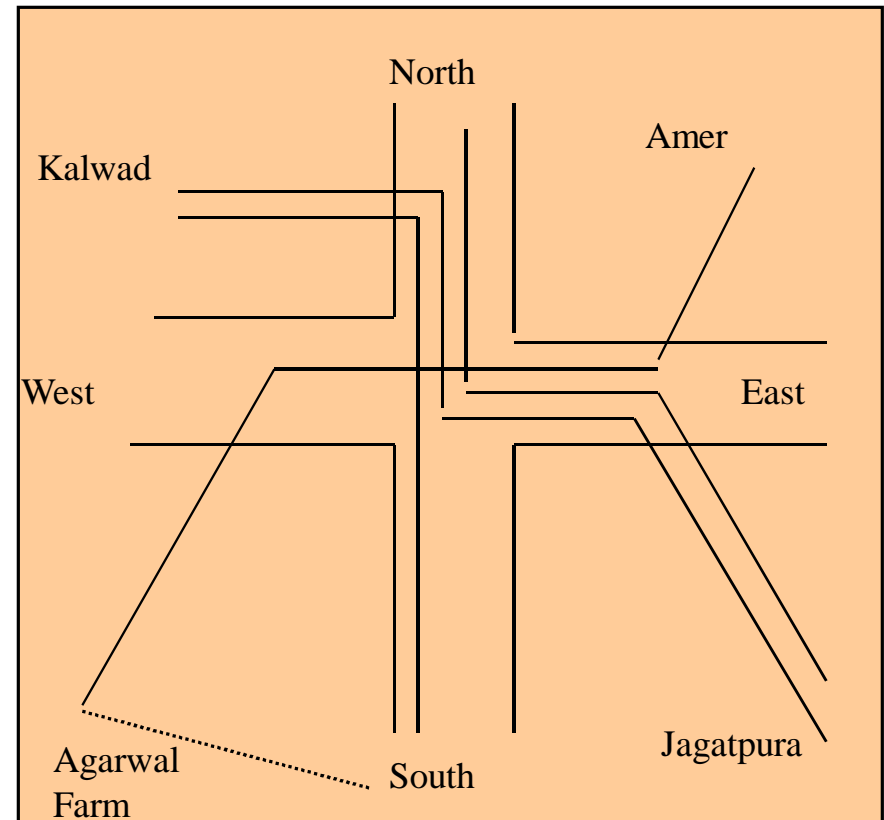
Operation Plan for Buses

• Design of Direct Services:

- Connecting Railway Station & Bus Terminal
- Connecting Madhyam Marg & Amer
- Connecting Kalwad & Jhontwara
- Extending Mansarovar end till Sanganer
- Connecting Jagatpura

• Design of Chartered Services:

- Integration with Rail link and Air Link
- Operation of women special services, secretariat special, school services etc



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Fleet Requirement

S. No.	Route Details	Route Length	Frequency (Mts.)	Running Time(Mts.)	Stand Tims (Mts.)	Fleet Required
1.	Transport Nagar- Sikar. Road (Ajmer By Pass)	19	8	45	5	13
2.	Transport Nagar- Sanganer Via Amrut Nagar	24	8	58	5	16
3.	Sanganer-Sikar. Road (Ajmer By Pass)	22	8	53	5	15
4.	Sanganer- Kalwad Via Jhotwara	21	8	49	5	14
5.	Amer-Agarwal Farm Via Badi Chopat & Cubhash Chowk	24	8	58	5	16
6.	Sanganer- Transport Nagar Via Durgapura	18	8	43	5	12
7.	Kalwad to Jagat Pura	26	8	63	5	17
8.	Sikar. Road (Ajmer by Pass) to Jagat Pura	26	8	63	5	17
Total						120

Frequency of Services:

- E (Tpt Nagar).....2.7 min
- S (Sanganer)..... 2.7 min
- N (Chomu Puliya).....2 min
- W (Sodala).....4 min
- S-E (Jagatpura).....4 min
- N-E (Kalwad).....4 min

Span of Operation: 5-30 Hr to 23.00 Hr

S. No.	Period	Traffic Intensity	Service Provision
1	5.30 to 6.30 Hours	Slack	Reduced Frequency
2	6.30 to 13.30 Hours	Normal/Peak	Standard/Additional Frequency
3	13.30 to 15.30 Hours	Slack	Reduced Frequency
4	15.30 to 21.30 Hours	Normal/Peak	Standard/Additional Frequency
5	21.30 to 23.00 Hours	Slack	Reduced Frequency

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Business Structure of BRT

- **Business Model**

- Formulation of Special Purpose of Vehicle (SPV)
- BRT operation through PPP model
- SPV responsible for planning, monitoring & Quality control
- Physical assets like buses will be procured by private enterprises
- Infrastructure like roadway, stations etc developed by SPV/JDA

- **Business Philosophy**

- Operation would be customer driven and customer oriented

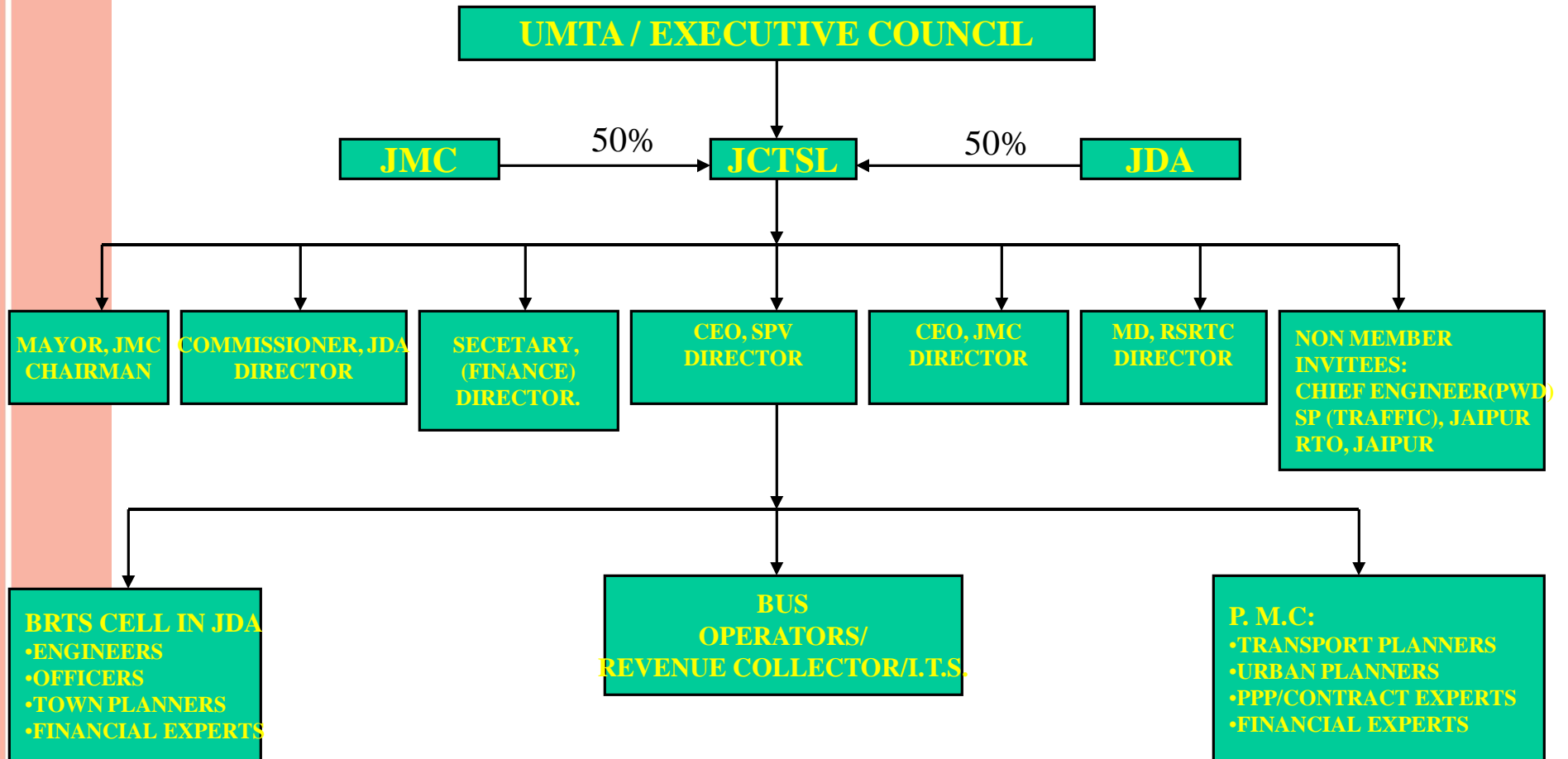
- **Business Associates**

- Business Associates (operators) selected for BRT operations shall have a minimum fleet of 25 vehicles.

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ORGANISATIONAL STRUCTURE



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Business Plan

- **Business Model: *option-1***

- Buses owns, operates, maintains and replace by operators
- SPV will stipulate the routes, schedules and terms/conditions
- Payment to operator on km basis (linked to L.F. and daily fare box revenues)
- Outsourcing of fare collection correlating revenue generation
 - Integration amongst trunk & feeder services
 - Facilitate integration of station management, PIM & Data Acquisition and communication activities with revenue collection
 - Apportioning of revenue from multiple journey tickets, monthly/free passes
 - Needs proper estimates of operation cost before go ahead

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Business Plan

- **Business Model: *option-2***

- On the basis to pay AOCC charged to SPV
- Operator will also collect the revenue and pay AOC to SPV
 - Easy to operate and manage
 - All responsibilities rest with the operators
 - Problem in providing integrated ticketing system, common revenues
 - Safety hazard-excessive competition amongst operators
 - Acquisition of data for travel/oper. Informations to SPV may be difficult

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Business Plan

- **Operational Cost Estimates:**

(Rs per km)

COST HEAD	TRUNK LINE	FEEDER LINE
BUS HIRING CHARGES	22.00	11.02
BRT ADMIN CHARGES	7.02	7.73
TOTAL	29.02	18.75

- **Tariff Structure:**

- Technical fare (ppk)- 60 paise (toward operation cost)
- Customer fare (ppk)- 65 paise (extra 8% as contingency fund)
- Optimal fare (ppk)- 81 paise (system profitability, affordability, Rider ship & sustainability)

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Project Progress

1. Package-I (C Zone bypass to Panipech) has got approved by MoUD, Gol on July 28, 2007- Rs 75.19 Crores
2. Tenders invited, total 19 sold, 9 participated and 4 were technically qualified.
3. Lol issued to L-1 bidder (tender premium~ 9%)
4. Total Estimated time of completion - 11 months
5. North-South Corridor to be Completed by end of 2008 on priority
6. Completion of N-S corridor of 26 km as major trunk route across the entire city.
7. Simultaneous process of stakeholders consultation
8. Formation of Committee for fixing the bus specification
9. Total 70 buses are planned to be operated in first phase

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Issues:

1. NECESSITY OF HAVING BRTS ACT IN PLACE (SEEKING EXAMPLES)
2. GFC DRAWINGS AND THEIR EFFECTIVE IMPLEMENTATION
3. TREATMENT OF EXISTING MINI BUSES/PRIVATE OPERATORS

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Thanks

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